

**REMARKS**

Applicant respectfully requests reconsideration and allowance of the subject patent application.

Formal drawings incorporating the previously approved changes to the drawings and addressing the issue identified on the PTO-948 form sent with paper no. 2 are enclosed herewith.

Claims 1, 25 and 41 have been amended to provide consistent usage of the term "field". Consequently, withdrawal of the objection to claims 1-9, 12-26, 29-42, 45 and 56 is respectfully requested.

Claims 1, 4-9, 13, 19, 21-26, 30, 36 and 38-42 were rejected under 35 U.S.C. Section 103(a) as allegedly being unpatentable over St. Ville (U.S. Patent No. 5,594,651) in view of Castanie *et al.* (U.S. Patent No. 6,290,889), and further in view of Yamazaki (U.S. Patent No. 6,197,624), Johnson *et al.* (U.S. Patent No. 6,296,667) and Phipps *et al.* (U.S. Patent No. 6,289,242).

Independent claims 1, 25 and 41 describe methods in which structural fibers of a composite material are laminated in a matrix into which an impurity is introduced, the amount of the impurity introduced into the matrix being controllably variable for the respective volume increments of an object. *See, e.g.*, the description on pages 6-7 and page 28 *et seq.* of the specification. As noted in this description, the matrix may be a resin matrix and claims 1, 25 and 41 have been amended to more specifically describe the claimed matrix as a "resin" matrix.

Applicants respectfully submit that the subject matter of these claims and the claims that depend therefrom would not have been rendered obvious by the proposed five-way combination of St. Ville, Castanie *et al.*, Yamazaki *et al.*, Johnson *et al.* and Phipps *et al.* In particular, this combination (even assuming for the sake of argument that sufficient motivation could be identified for meaningfully combining five disclosures from such disparate technologies) does not disclose or suggest, among other things, introducing an impurity into the resin matrix of a composite material as claimed.

Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.* are applied to supply features identified in the office action as missing from St. Ville.

Castanie *et al.* is cited for its disclosure of composite materials that consist of "reinforcing fibres embedded in a polymerized organic resin matrix." Castanie *et al.*, col. 1, lines 9-11. However, Applicant finds no disclosure in Castanie *et al.* of introducing impurities into the resin matrix of the composite material as claimed.

Yamazaki is alleged in the office action to teach the introducing of an impurity into an object while the object is manufactured, wherein an amount of the impurity is variable for the respective volume increments of the object. In this regard, the office action references the disclosure of Yamazaki at col. 1, lines 38-40 and 65-67 and col. 2, lines 15-33 and lines 44-46. The disclosure at col. 1, lines 38-40 refers to "contamination impurities", which are described several lines later as something that is desirably *prevented*. See col. 1, line 45-50 ("Although the introduction of contamination impurities into the active layer and mobile charges into the gate insulating film can be prevented by cleaning a processing environment ..."). Consequently, this portion of Yamazaki actually teaches the desirability of avoiding the introduction of certain impurities and clearly does not teach or suggest introducing impurities as claimed. The other referenced portions of Yamazaki relate to using an impurity element (selected from Group 13 or Group 15 elements) in a crystalline silicon film in order to control the threshold voltage of a TFT. However, among other things, the crystalline silicon layer into which Yamazaki introduces Group 13 or Group 15 impurity elements is clearly not a resin matrix of a composite material as claimed.

Moreover, absent hindsight, the semiconductor device of Yamazaki would not have fairly provided any relevant teaching or suggestion with respect to a resin matrix for a composite material in view of the significant differences between a semiconductor device (as in Yamazaki) and a composite material comprised of a resin matrix and structural fibers (as in the pending claims). In other words, it is not apparent how the knowledge obtained from Yamazaki that impurities can be implanted to control the threshold voltage of a transistor would have provided any meaningful teaching or

suggestion relevant to composite materials comprising a resin matrix and structural fibers.

Johnson *et al.* relates to bone substitutes and is applied for its alleged teaching of a matrix into which an impurity is introduced. The Johnson *et al.* disclosure makes several references to a "matrix". Col. 1, lines 26-27 make reference to "an osteoconductive matrix providing a scaffold for bone ingrowth." Col. 4, lines 20-24 describe that "[i]n yet another embodiment, the interstices of the strong framework are filled with a composite of a biocompatible, bioresorbable resilient material as a matrix containing particles of calcium phosphate or other osteoconductive material." Col. 6, lines 19-20 makes reference to "demineralized bone matrix." Finally, col. 6, lines 61 *et seq.* make reference to "pores" in a matrix. Applicant does not find any of these references to "matrix" to disclose or even suggest a resin matrix of a composite material, much less the introducing of impurities into such a resin matrix as claimed.

Phipps *et al.* relates to the electrically assisted delivery of a therapeutic agent through a body surface such as a mucosal membrane. Phipps *et al.* describes a gel matrix 21 which contains the drug or agent species (not shown) which is to be transdermally delivered across the skin barrier. The drug is uniformly dispersed in matrix 21. A list of active agents is set forth at col. 16, line 46 *et seq.* The matrix of Phipps *et al.* is clearly not a resin matrix and the disclosure of uniform dispersal of the drug does not teach or suggest the controllable variability aspect of claims 1, 25 and 41.

In summary, Applicant respectfully submits that none of the documents relied upon in the rejection discloses the concept of introducing an impurity into a resin matrix of a composite material, wherein the amount of the impurity introduced into the matrix is controllably variable for the respective volume increments of an object. In addition, Applicant respectfully submits that these documents, taken either alone or in some combination, are not suggestive of this feature because, among other things, these documents relate to, for example, controlling threshold voltage of a transistor, bone substitutes and a gel matrix for the transdermal delivery of drugs.

For at least these reasons, Applicant respectfully submits that the proposed combination of St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.* does not render claims 1, 25 and 41 obvious.

Claims 4-9, 13, 19, 21-24, 26, 30, 36 and 38-40 and 42 respectively depend from one of claims 1, 25 and 41. The proposed combination of St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.* does not render these dependent claims obvious at least because of the reasons advanced above with respect to claims 1, 25 and 41.

Claims 56 and 2 were rejected under 35 U.S.C. Section 103(a) over the proposed five-way combination of St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.*, in further view of Wu *et al.* Wu *et al.* does not remedy the above-discussed deficiencies of the St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.* combination with respect to claim 1, from which claims 56 and 2 depend. As such, even were the combination carried out, the subject matter of these claims would not result.

In addition, as previously discussed, Wu *et al.* relates to stacking sequences that can be used to provide a multi-material fully isotropic laminate (MFIL) and a multi-material quasi-homogenous anisotropic laminate (MQHAL). A laminate is a flat plate or curved shell consisting of two or more plies stacked and bonded as an integral component for structural applications. Each ply is a uniform thickness layer of material. The arrangement of the material, thickness, orientation, and stacking sequence of the plies is referred to as the layup of the laminate. MFILs are obtained by shuffling the stacking sequences of certain laminates. As the number of plies increases, the possibility of finding a sequence that constitutes a MFIL also increases. Wu *et al.* refers to this problem of finding a sequence as an "integer problem" and explains that a computer program is used to systematically search through integer distribution patterns to find patterns that that constitute a MFIL. MQHAL layups can be obtained by altering an MFIL.

Applicant respectfully submits that the concept in Wu *et al.* of searching distribution patterns to find patterns that satisfy certain criteria would not have taught or

suggested specifying a particular symmetry for the material properties of volume elements in a finite element model. For this additional and independent reason, claims 56 and 2 are believed to be allowable.

Claim 3 was rejected under 35 U.S.C. Section 103(a) as allegedly being obvious over the proposed St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.* and Phipps *et al.*, Wu *et al.* combination, in further view of Legere *et al.* (U.S. Patent No. 6,087,571). Legere *et al.* discloses that the uniaxially oriented materials described therein may be transversely isotropic. Among other things, Legere *et al.* does not remedy the above-discussed deficiencies of the other documents in connection with, for example, claim 1 (from which claim 3 depends). Thus, even assuming that the combination of Legere *et al.* with the proposed St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.*, Phipps *et al.*, and Wu *et al.* combination would have been proper and that the combination were made, the combination would not have resulted in the subject matter of claim 3.

Various documents (*i.e.*, Abatangelo, Johnson *et al.*, Bonadio *et al.*, Warren, Jr., Tadros *et al.*, Slaikeu, Hermann, Phipps *et al.*, and Mavity *et al.*) are cited as allegedly showing biologic materials, bone, crushed bone, co-factors, biological cells, bio-active material, medications, antibiotics, and radioactive materials as set forth in various dependent claims. Applicant does not acquiesce in the characterizations in the office action of these documents. In any event, none of these documents teaches or suggests introducing an impurity into the resin matrix of a composite material as claimed in claims 1, 25 and 41. Consequently, the combination of these documents with any or all of St. Ville, Castanie *et al.*, Yamazaki, Johnson *et al.*, Phipps *et al.*, and Wu *et al.* would not have resulted in the subject matter of these dependent claims.

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**Serial No.: 09/643,982**  
**Response to Office Action dated November 30, 2004**

The pending claims are believed to be allowable and favorable office action is respectfully requested.

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

A handwritten signature in cursive script, appearing to read "Michael J. Shea", is written over a horizontal line.

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